AD-A191 904 X-Y-THETA-Z STAGE FOR MASKED ION BEAM LITHOGRAPHY(U) 1/1
NAVAL OCEAN SYSTEMS CENTER SAN DIEGO CA
J W REEDS ET AL. MAY 87

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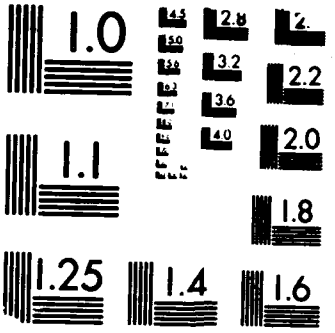

MICROCOPY RESOLUTION TEST CHART

AD-A191 904

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REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION: UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT: Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION: Naval Ocean Systems Center	6b. OFFICE SYMBOL (If applicable)
6c. ADDRESS (City, State and ZIP Code): San Diego, CA 92152-5000	7a. NAME OF MONITORING ORGANIZATION 7b. ADDRESS (City, State and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION: Naval Air Systems Command	8b. OFFICE SYMBOL (If applicable): NAVAIR
8c. ADDRESS (City, State and ZIP Code): Washington, DC 20361	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO	AGENCY ACCESSION NO.
78011N	ET50	R1050	DN388 597

11. TITLE (Include Security Classification): X-Y-O-Z Stage for Masked Ion Beam Lithography

12. PERSONAL AUTHOR(S): I. Lagnado

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Journal Article	FROM _____ TO _____	May 1987	

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

A mechanical stage and electronic drive servos have been built which provide six degrees of freedom of motion in positioning. The stage is used in conjunction with a mask-wafer alignment sensing system to align a semiconductor wafer with a mask to 0.1 micrometer tolerance in a masked ion beam exposure system. Because the exposure system utilizes a step and repeat mode of operation, the stage system was designed to operate at high speed to achieve high wafer throughput. A backlash free capstan drive system is used on the X, Y, and θ (Theta) servos to achieve the high precision, high speed performance.

The wafer to be exposed is mounted on top of an X-Y stage, which is, in turn, mounted on a rotary (θ) stage, which is then mounted on a platform. The platform is supported from a base by three deformable diaphragms which allow limited vertical (Z) or tilt motion of the entire stage assembly. In step and repeat operation, the X and Y motions are relatively large from the chip-to-chip, while the θ and Z motions are very small. Mounting the X-Y stage on the top of the stage assembly provides the design with the lowest mass to be accelerated in stepping, and has the additional advantage that the algorithms for providing mask-wafer alignment error signals remain the same no matter where the chip being aligned is located on the wafer. Dedicated microprocessors for each of the X, Y, and θ axes, incorporating digital error integration, provide the required precision of motion.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
I. Lagnado	619-225-6735	Code 5503

DD FORM 1473, 84 JAN

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X-Y-θ-Z STAGE FOR MASKED ION BEAM LITHOGRAPHY

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ABSTRACT

A mechanical stage and electronic drive servos have been built which provide six degrees of freedom of motion in positioning. The stage is used in conjunction with a mask-wafer alignment sensing system to align a semiconductor wafer with a mask to 0.1 micrometer tolerances in a masked ion beam exposure system. Because the exposure system utilizes a step and repeat mode of operation, the stage system was designed to operate at high speed to achieve high wafer throughput. A backlash free capstan drive system is used on the X, Y, and θ servos to achieve the high precision, high speed performance.

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